Claims

What is claimed is:

1. A method, comprising:

providing a fiber which has a side surface formed on fiber cladding where an evanescent field of guided light in the fiber exists, and a waveguide formed over the side surface;

exposing the waveguide to an external medium to cause a change at the side surface;

monitoring a wavelength shift in a spectral peak in optical loss of light guided in the fiber; and

extracting information about the external medium based on the wavelength shift.

2. The method as in claim 1, wherein the information about the external medium includes a temperature in the external medium.

3. The method as in claim 1, wherein the information about the external medium includes a pressure in the external medium.

4. The method as in claim 1, wherein the information about the external medium includes a presence of a selected material.

5. The method as in claim 1, further comprising controlling polarization of guided light to allow for guided light in a selected linear polarization to pass through a fiber segment with the side surface to reduce noise.

6. A sensing device, comprising a fiber having a side surface formed on fiber cladding within a reach of an evanescent field of guided light in the fiber, a waveguide formed over the side surface and having a refractive index greater than an effective refractive index of the fiber, and an optical detector to receive guided light in the fiber transmitting through a section with the side surface to produce a detector output to represent a measurement of an external medium in contact with the waveguide.

7. The device as in claim 6, wherein the waveguide and the side surface operate in combination to evanescently couple guided light out of the fiber for wavelengths within a first spectral range, and wherein the fiber further comprises:

a second side surface formed on fiber cladding at a different location where the second side surface is within a reach of an evanescent field of guided light in the fiber,

a second waveguide formed over the second side surface and having a refractive index greater than an effective refractive

index of the fiber, wherein the second waveguide and the second side surface operate in combination to evanescently couple guided light out of the fiber for wavelengths within a second spectral range that does not overlap with the first spectral range,

a first coupler coupled to the fiber to couple light in the first spectral range out of guided light in the fiber transmitting through sections with the side surface and the second side surface to produce a first optical output to the optical detector,

a second coupler coupled to the fiber to couple light in the second spectral range out of guided light in the fiber transmitting through sections with the side surface and the second side surface to produce a second optical output, and

a second optical detector to receive the second optical output to produce a second detector output to represent a measurement of an external medium in contact with the second waveguide.

8. The device as in claim 6, further comprising a protection layer formed over the waveguide to prevent direct contact between the waveguide and an external medium, wherein the protection layer is thin to allow for the external medium to affect evanescent coupling at the side surface.

9. The device as in claim 6, further comprising a linear polarizer to control polarization of the guided light that is directed to pass through the fiber section with the side surface.

10. The device as in claim 9, wherein the linear polarizer is an in-line polarizer.

11. The device as in claim 9, wherein the linear polarizer is coupled in an input end of the fiber.

12. A sensing device, comprising:

a fiber having a side surface formed on fiber cladding within a reach of an evanescent field of guided light in the fiber;

a fiber grating formed in the fiber at the location of the side surface to reflect light of a selected wavelength;

a waveguide formed over the side surface and having a refractive index greater than an effective refractive index of the fiber; and

an optical detector to receive reflected light from the fiber grating and to produce a detector output to represent a measurement of an external medium in contact with the waveguide.

13. The device as in claim 12, further comprising a signal processor to process the detector output to produce the measurement from a shift in wavelength of the reflected light from the fiber grating.

14. The device as in claim 12, further comprising a linear polarizer to control input polarization of guided light to a selected polarization.

15. A sensing device, comprising:

a fiber;

a fiber sensor in the fiber comprising a side surface on fiber cladding of the fiber within a reach of an evanescent field of guided light in the fiber, and an overlay waveguide on top of the side surface to extract light out of the side surface;

a housing unit having a chamber to hold the fiber sensor and a movable diaphragm in the chamber to transmit pressure to the fiber sensor in response to a pressure applied to the diaphragm;

an optical detector to receive light in the fiber that transmits through the fiber sensor; and

a signal processor to process output of the optical detector and to determine the pressure on the diaphragm.

16. The device as in claim 15, wherein the overlay waveguide is made of a glass.

17. The device as in claim 15, further comprising a polarizer coupled the fiber to control input polarization.

18. A sensing device, comprising:

a substrate;

a fiber engaged to the substrate and comprising a side surface on fiber cladding within a reach of an evanescent field of guided light in the fiber;

an overlay waveguide on top of the side surface to extract guided light out of the fiber through the side surface;

a liquid layer on top of the overlay waveguide to interface with an external medium; and

an optical detector to receive guided light in the fiber transmitting through a section with the side surface to produce a detector output to represent a measurement of the external medium.

19. The device as in claim 18, wherein the measurement is a pressure in the external medium.

20. The device as in claim 18, wherein the measurement is a temperature in the external medium.

21. A method, comprising:

providing a fiber which has a side surface formed on fiber cladding where an evanescent field of guided light in the fiber exists, and a waveguide formed over the side surface;

using the waveguide to receive a pressure to be measured to cause a change at the side surface;

monitoring a wavelength shift in a spectral peak in optical loss of light guided in the fiber; and

determining the pressure applied on the waveguide based on the wavelength shift.

22. The method as in claim 21, further comprising:

providing an overlay liquid layer in direct contact with the waveguide to optically insulate the waveguide from a medium above the overlay liquid; and

exposing the overlay liquid layer to the pressure to cause a change in a refractive index of the overlay liquid.

23. The method as in claim 22, further comprising calibrating the wavelength shift for a shift caused by a temperature change in an environment in which the overlay liquid layer is located.

24. The method as in claim 23, wherein the calibration is performed by using a temperature sensor.